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मानक

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Mazdoor Kisan Shakti Sangathan

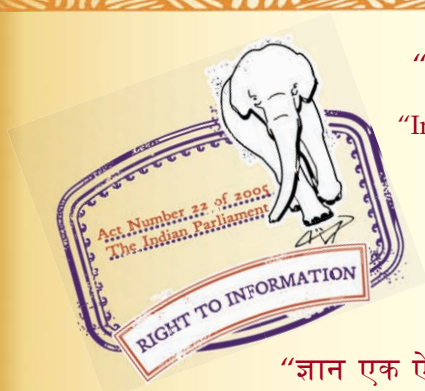
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IS 4910-5 (1989): Tyre yarns, cords and tyre cord warpsheets made from man-made fibres -Method of test, Part 5: Heat shrinkage and heat shrinkage force [TXD 1: Physical Methods of Tests]



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Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”



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*Indian Standard*

**TYRE YARNS, CORDS AND TYRE CORD  
WARPSHEETS MADE FROM MAN-MADE  
FIBRES — METHODS OF TEST**

**PART 5 HEAT SHRINKAGE AND HEAT SHRINKAGE FORCE**

**( *First Revision* )**

भारतीय मानक

कृत्रिम रेशों से निर्मित टायर सूत, डोरी और टायर डोरी ताना—चद्दरों की  
परीक्षण पद्धतियाँ

भाग 5 ऊष्मा सिकुड़न और ऊष्मा सिकुड़न बल

( पहला पुनरीक्षण )

UDC 677·072·6 : 629·11·012·553·1 : 677·019·35

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**BUREAU OF INDIAN STANDARDS**  
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## FOREWORD

This Indian Standard (Part 5) (First Revision) was adopted by the Bureau of Indian Standards on 7 June 1989, after the draft finalized by the Physical Methods of Test Sectional Committee had been approved by the Textile Division Council.

This standard, which was first published in 1970 (as Part 4), has been revised to incorporate changes on the basis of experience gained during its use.

In the preparation of this standard, due weightage has been given to the testing practices followed in the country in this field. Assistance has been derived from ASTM Designation: D 885-1981 'Standard methods of testing industrial filament yarns, tyre cords, and tyre cord fabrics made from man-made organic-base fibres', issued by the American Society for Testing and Materials, USA.

This standard (Part 5) forms a part of the series of standards under the title 'Methods of test for tyre yarns, cords, and tyre cord warpsheets made from man-made fibres'. The other parts under the series are:

- IS 4910 (Part 1) : 1989 Definition of terms
- IS 4910 (Part 2) : 1989 Linear density
- IS 4910 (Part 3) : 1989 Load and elongation characteristics
- IS 4910 (Part 4) : 1989 Dip pick-up
- IS 4910 (Part 6) : 1989 Wet contraction and wet contractile force
- IS 4910 (Part 7) : 1989 Heat degradation
- IS 4910 (Part 8) : 1989 Thickness
- IS 4910 (Part 9) : 1978 Sampling for tyre yarns, cords and tyre fabrics made from rayon
- IS 4910 (Part 10) : 1989 Creep
- IS 4910 (Part 11) : 1989 Commercial mass
- IS 4910 (Part 12) : 1989 Sampling for tyre yarns, cords and tyre cord fabrics made from polyamide
- IS 4910 (Part 13) : 1989 Static adhesion of textile tyre cord to vulcanised rubber

Clauses 3.1 and 6.2 call for an agreement between the buyer and the seller.

In reporting the result of a test made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'.

*Indian Standard*

# TYRE YARNS, CORDS AND TYRE CORD WARPSHEETS MADE FROM MAN-MADE FIBRES — METHODS OF TEST

## PART 5 HEAT SHRINKAGE AND HEAT SHRINKAGE FORCE

### ( First Revision )

#### 1 SCOPE

**1.1** This standard ( Part 5 ) prescribes method for determination of heat shrinkage and heat shrinkage force developed in nylon ( polyamide ) tyre yarns and cords when exposed to elevated temperature under a standard pre-tension of  $4.4 \pm 0.9$  mN/tex. This standard is applicable to nylon ( polyamide ) tyre yarns and cords taken from cheeses, cones, bobbins, spools or tyre cord warpsheets. In case of tyre cord warpsheets, the cords shall be removed from the warpsheets for testing.

#### 2 SAMPLING

**2.1** Samples from the lot shall be drawn so as to be representative of the lot. Sample drawn in accordance with the procedure laid down in the relevant material specification or as agreed to between the buyer and the seller shall be held to be representative of the lot.

#### 3 CONDITIONING OF TEST SAMPLE

**3.1** Unless otherwise agreed to between the buyer and the seller, the test samples shall be conditioned to a state of moisture equilibrium from dry side in standard atmosphere at  $65 \pm 2$  percent relative humidity and  $27 \pm 2^\circ\text{C}$  temperature. A standard temperature of  $20 \pm 2^\circ\text{C}$  may also be used provided it is declared in the test report.

NOTE — When a test sample under zero tension has been left in such a way as to expose, as far as possible, all portions of it to the standard atmosphere for 24 hours, the test sample shall be deemed to have reached a state of moisture equilibrium.

#### 4 APPARATUS

##### 4.1 Mounting Device

The device shall be such that a test specimen of at least 250 mm length can be mounted on it with one of its ends in a fixed clamp under desired dead weight tension and exposed to a temperature of  $150 \pm 2^\circ\text{C}$ ,  $160 \pm 2^\circ\text{C}$  or  $175 \pm 2^\circ\text{C}$  as the case may be. It shall be provided with means for:

- measuring the heat shrinkage percentage directly or the initial and final lengths of test specimen to an accuracy of 1 mm during exposure to a high temperature in case of heat shrinkage test, and
- attaching one clamp to a strain gauge or mechanical device capable of indicating tension to an accuracy of 1 g without any significant changes in the length of the specimen in case of heat shrinkage force test.

#### 5 PROCEDURE

**5.1** Mount the conditioned test specimen on the mounting device under a standard pre-tension of  $4.4 \pm 0.9$  mN/tex. Note the original length of the test specimen for heat shrinkage test and initial tension in the case of heat shrinkage force test.

**5.2** Expose the test specimen as mounted above to a temperature of  $150 \pm 2^\circ\text{C}$ ,  $160 \pm 2^\circ\text{C}$  or  $175 \pm 2^\circ\text{C}$  ( as agreed to between the parties ) and keep it in this position until change in shrinkage/shrinkage force in the test specimen in 1 minute interval is not more than 5 percent. Note the final length or force, as the case may be, while the specimen is still exposed to higher temperature.

**5.3** Take at least 5 readings.

**5.4** Calculate the heat shrinkage and heat shrinkage force as follows:

$$\text{a) Heat shrinkage, percent} = \frac{a - b}{a} \times 100$$

where

$a$  = original length of the specimen, and

$b$  = final length of the specimen.

$$\text{b) Heat shrinkage force in mN/tex} = \frac{f_1 - f_2}{t}$$

where

$f_1$  = final tension in mN developed in the specimen,

$f_a$  = initial tension in mN in the specimen, and

$t$  = linear density of tyre yarn or cord in tex.

## **6 REPORT**

**6.1** The report shall include the following

information:

- a) Type of material,
- b) Elevated temperature used,
- c) Heat shrinkage,
- d) Heat shrinkage force,
- e) Number of tests, and
- f) Temperature used for conditioning, that is,  $27 \pm 2^\circ\text{C}$  or  $20 \pm 2^\circ\text{C}$ .

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